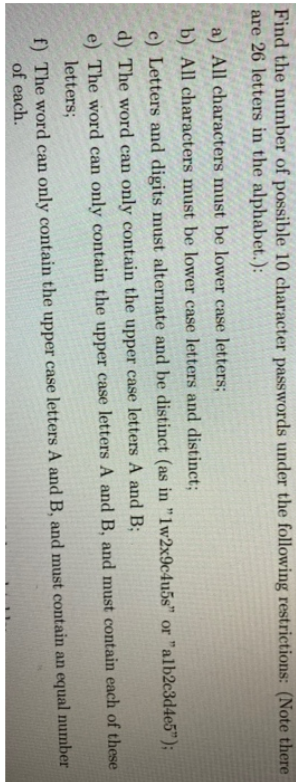


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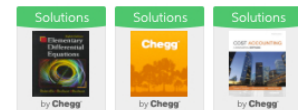
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(a) All characters must be lower case letters.

Solution: 26^{10}

(b) All characters must be lower case letters and distinct.

Solution: $26 \cdot 25 \cdot 24 \cdots 17 (= 26!/16!)$

(c) Letters and digits must alternate and be distinct (as in "1w2x9e4u5s" or "a1b2c3d4e5").

Solution: $2 \cdot (26 \cdot 25 \cdot 24 \cdot 23 \cdot 22) \cdot (10 \cdot 9 \cdot 8 \cdot 7 \cdot 6)$: 2 counts the two possible patters LDLDLDLDLD and DLDLDLDLDL, where L and D denote letters and digits; $26 \cdots 22$ is the number of ways to fill the L slots with distinct letters, and $10 \cdots 6$ is the number of ways to fill the D slots with distinct digits chosen from $0, 1, \dots, 9$. (This assumes that only lower case letters are allowed.)

(d) The word can only contain the upper case letters A and B.

Solution: 2^{10} : There are 2 choices for each of the 10 slots for the letters, giving $\underbrace{2 \cdot 2 \cdots 2}_{10} = 2^{10}$ choices altogether.

(e) The word can only contain the upper case letters A and B, and must contain each of these letters.

Solution: $2^{10} - 2$: Subtract 2 from the previous count to exclude the words consisting of all A's or all B's.

(f) The word can only contain the upper case letters A and B, and must contain an equal number of each.

Solution: $\binom{10}{5}$: Choose 5 slots out of the 10 available to fill with A's ($\binom{10}{5}$ ways to do this), and put B's into the remaining slots ($\binom{5}{5} = 1$ ways).

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3. With double-digit annual

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A: [See answer](#)

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